APPENDIX 6.8-A

Fish Habitat Compensation Plan for the Proposed Work by Melford International Terminal Inc.

Fish Habitat Compensation Plan
for the
proposed work
by
Melford International Terminal Inc.

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Introduction

Habitat compensation may be considered when it is predicted that a work or undertaking will cause residual effects that are deemed harmful to the productive capacity of fish habitat. Compensation is defined in the document entitled *Policy for the Management of Fish Habitat*, October 1986, as "the replacement of natural habitat, increase in the productivity of existing habitat, or maintenance of fish production by artificial means in circumstances dictated by social and economic conditions, where mitigation techniques and other measures are not adequate to maintain habitats for Canada's fisheries resources". The Melford International Terminal Inc. project has been mitigated to the fullest extent possible and there are net losses of habitat. In this document the habitats are characterized, quantified, and suitable compensation is proposed.

Project Information

Project Name:	Container Terminal Facilities, Melford Nova Scotia
Location:	Strait of Canso,
Authorization No.:	
Effective Period:	2008 to 2015
Proponent:	Melford International Terminal Inc
Contact:	Carmen D'Intino
Address:	1809 Barrington Street, Suite 1201, CIBC Building, Halifax, NS B3J 3K8
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Project Location

Strait of Canso, Chedabucto Bay, Middle Melford, Guysborough County, Nova Scotia.

Approximate coordinates of the marine portion of the project.

Marine infill 45 32.180N 61 18.015W: 45 32.230N 61 17.980W; 45 32.230W 61 17.980: 45 31.895N 61 17.280W. (NAD83)

Marine dredging 45 32.015N 61 17.525W: 45 31.900N 61 17.245W; 45 32.030N 61 17.345W (NAD83)

Freshwater within the logistics park 45 32.120N 61 17.975W; 45 31.625 61 17.170 W; 45 31.100N 61 16.875W; 45 29.895N 661 17.655W; 45 30.515 61 19.285W.

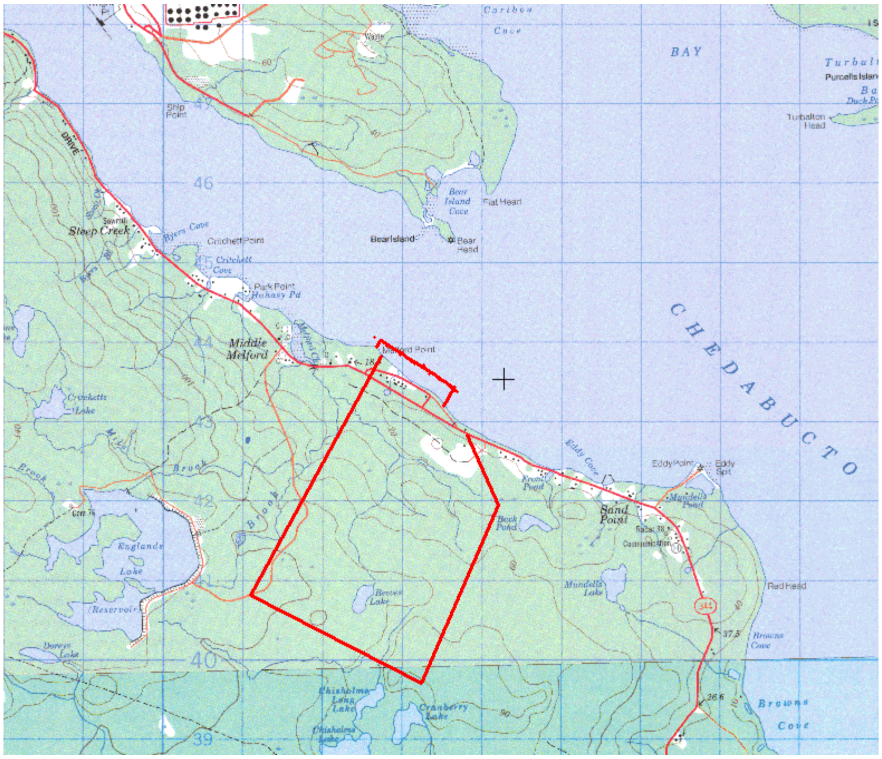


Fig 1 Project location: showing the marine infill area and the logistics park area. Topo map 11F11

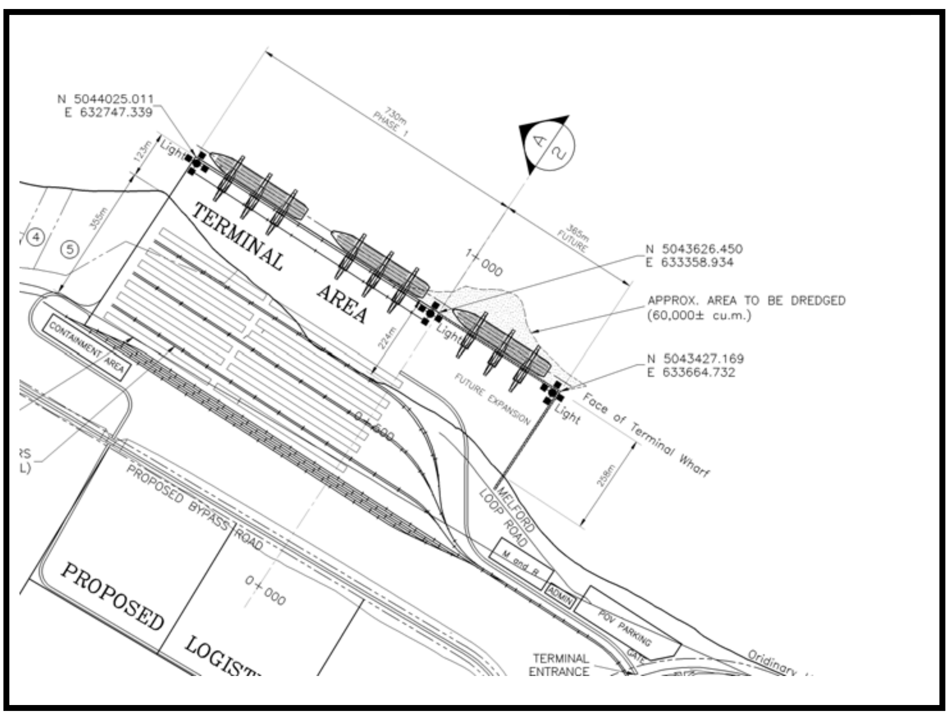


Fig 2 Marine terminal detail: showing the infill and dredged areas.

Project Description

The project is described in detail in the Environmental Assessment by AMEC May 2008.

Description of Planned Mitigation Measures
Mitigation plans have been included in the Environmental Assessment by AMEC May 2008.

Harmful Alteration, Disruption or Destruction of Fish Habitat (HADD)

Marine habitat directly impacted

The area in which the HADD will occur has been surveyed using underwater video along the transects shown on fig 3 and locations in table 1.

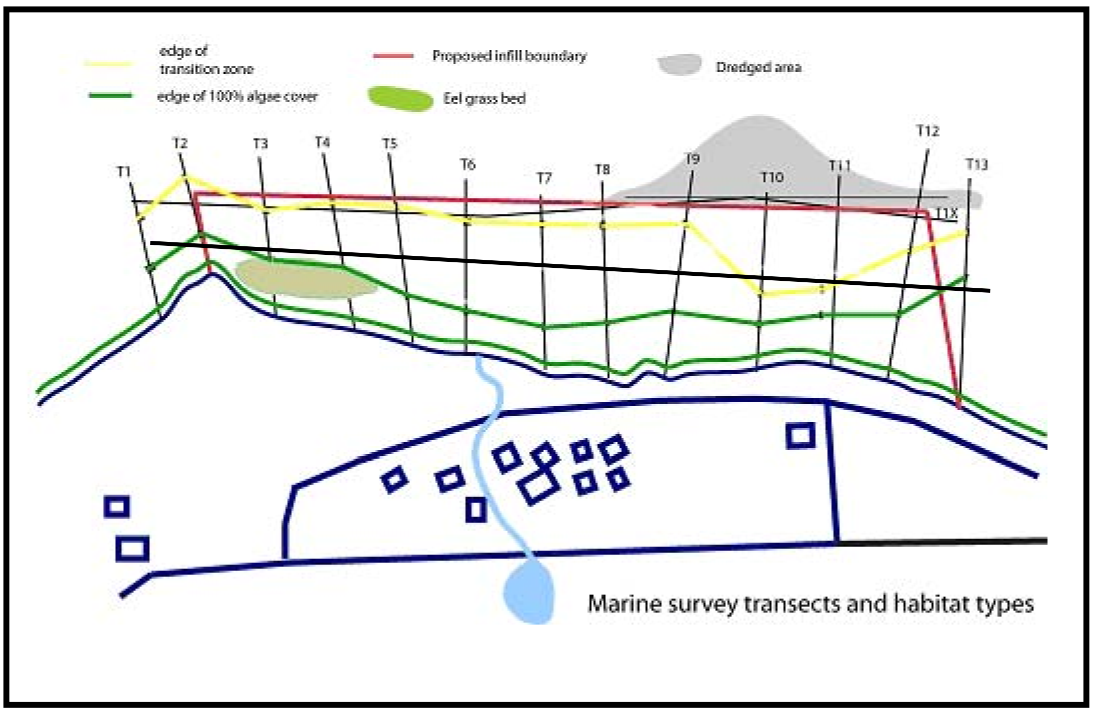


Fig 3. Location of spring 2008 video transects and habitat types

Table 1 Melford Transect Lat and Long (NAD83)

Transect Number	Start			Finish		Length m
	Latitude (N) DM	Longitude (W) DM		Latitude (N) DM	Longitude (W) DM	
1	45 32.185	61 18.020		42 32.260	61 18.046	180
2	45 32.179	61 18.027		45 32.253	61 17.975	160
3	45 32.128	61 17.988		45 32.218	61 17.895	195
4	45 32.087	61 17.993		45 32.193	61 17.883	215
5	45 32.058	61 17.879		45 32.156	61 17.770	235
6	45 32.015	61 17.841		45 32.114	61 17.712	235
7	45 31.978	61 17.768		45 32.069	61 17.650	270
8	45 31.951	61 17.710		45 32.050	61 17.581	270
9	45 31.918	61 17.664		45 32.013	61 17.486	270
10	45 31.880	61 17.577		45 31.972	61 17.430	260
11	45 31.856	61 17.501		45 31.954	61 17.357	260
12	45 31.815	61 17.448		45 31.919	61 17.240	290
13	45 31.769	61 17.401		45 31.886	61 17.220	320
Across outer	45 32.260	61 18.045		45 31.875	61 17.255	1255
Across middle	45 32.242	61 18.075		45 31.851	61 17.336	1200
					TOTAL	3160

DVD video of the transects is available upon request.

Qualitative assessment of the character of the surficial sediment and associated epibenthic flora and fauna was made based on underwater video reconnaissance taken in the spring of 2008. Thirteen transects, relatively evenly spaced and positioned at right angles to the coast, extending to a maximum of 300 m. In addition, two horizontal transects of about 1200 m in length running parallel to shore were also reviewed. Video analysis only included the recognition of major benthic algae and epifauna; infauna was not assessed. Over 3100 m of benthic habitats were examined.

Underwater video reconnaissance revealed four major faunal zones within the area surveyed. A discussion of these areas along with their associated surficial substrate character is present below.

Area "A" intertidal and immediate sub tidal.

Substrate:
In the near shore area the substrate is clean cobble/gravel and does not support very much life because of its' wave exposure and related high mobility. This area is a small narrow band along the shore as shown in fig 3 between the green and blue lines.

Flora and Fauna:
There is patchy macrophytic algae where there are large rocks providing some shelter and a non-mobile substrate.

Pic 1 Inshore substrate on transect 11

Pic 2 Shore substrate on transect 11

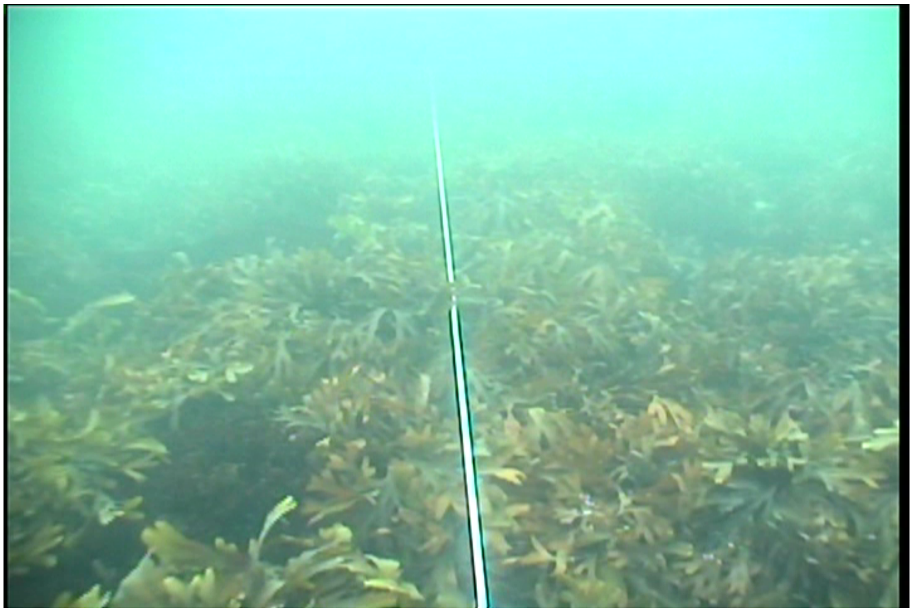
Area “B”: high percentage algae cover

Substrate:
The surficial substrate of this area is characterized by clean, well-sorted gravel to cobble sized rock. A few boulders and ledge outcrops are present. There is no silt material deposited within this area. Water depths range from 1m to 6m.

Flora and Fauna
This area is dominated by thick dense beds of macrophytic algae. Fucus serratus (toothed wrack) predominates. This species is most extensively developed near shore producing a dense canopy of macrophitic algae. Proceeding seaward towards Area “D” the near monoculture of F. serratus blends into mixed broad and bushy leaf macrophytes of diverse species composition. Encrusting coralline algae covers all hard substrates such as rocks and shells as a thin veneer.

Periwinkles (Littorina sp.) are the dominant epibentic invertebrate inhabiting the surficial coarse gravel/cobble rock substrate under the dense algal canopy of this area. Although not seen, it is likely that small hermit crabs (Pagarus sp.) inhabit old periwinkle shells, but these were not observed directly. Only very rarely, over all of the 13 transects examined, were benthic amphipods seen within this Area “B”. In addition, small starfish (Asterias sp.) were only recorded on a limited number of occasions and in these instances the starfish appeared in poor condition. No sea urchins, blue mussels, barnacles, shore crabs or other major faunal group (other than the periwinkles), common to rocky intertidal and subtidal environments of temporal/boreal coastal marine ecosystems, were observed in this area over all of the 13 transects surveyed.

There is very high primary productivity in this area but unexpectedly low secondary productivity. This may be due to the fact that water temperatures were 0^0 C to 2^0 C during the 2008 sampling. Transects collected in June 2007 show the presence of lobster and crab in very low numbers but the other species mentioned above were still absent or in very low numbers. This is true for all of the habitat types in the development area and there is no clear answer as to why this might be the case. This area is shown in fig 3 between the two green lines.



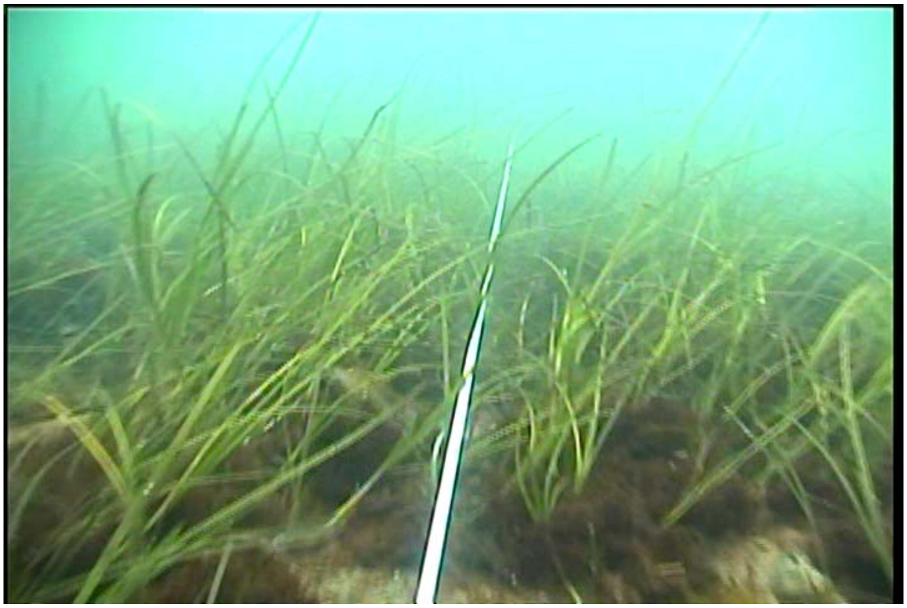
Pic. 3 Typical algae cover on transect 4 at the 15 m mark, depth 2 m

Area “C”: Eelgrass Bed

Only one eelgrass bed (Zostrea marina) was found in the surveyed area. The substrate in this area is composed of coarse sand, likely superimposed over a gravel/cobble base. If the prevailing coastal current is from the northwest to southeast as would be expected then the eelgrass bed is on a depositional area in the lee of the point. This isolated oasis of sand is a substrate type that is more conducive to eelgrass establishment, propagation and production than coarse gravel and cobble found in adjacent areas. The bed is on the edge of the dense macrophytic algal community in water depths between 3m to 5 m. The eelgrass is shown in fig 3 as a green polygon.

Flora and Fauna
Eelgrass dominates this surveyed area. However, there are sporadic clumps of poorly developed Fucus serratus and other leafy macrophytes within the area. There is no dense algal canopy as seen in Area “B”.

Periwinkles are not abundant in the eelgrass and there was no evidence of other benthic faunal groups such as sea urchins, bivalves, crabs, or polychaetes common to eelgrass beds found elsewhere along the coast of Nova Scotia.



Pic. 4. Typical eelgrass bed on transect 3 at the 35 m mark, depth 3 m

Area “D”: Transition Zone

Substrate:
This is a broad zone exhibiting a complex gradient of substrate types ranging from a coarse gravel/cobble matrix to increasingly fine sand to silt/clay fraction that covers the underlying coarse gravel/cobble matrix. Associated with this increasing amount of a silt/clay veneer deposit is a filamentous algal growth. Dense mussel shell debris beds begin to dominate the surface as Area “E” is approached. The silt/algal veneer covers this shell material. This band of dead horse mussel (Modiolus modiolus) shells is clearly seen in all transects and follows the yellow line on fig 3 ranging in depth from 10 to 15m but usually between 14 and 14.5m deep. Area ‘D” is shown on fig 3 between the green line and yellow line.

Flora and Fauna
This large area supports a complex diverse mixture of macrophytes with no one species dominating the community. Some F. serratus is present but a greater diversity of broad leafy and bushy kelp like species are in the majority. This high density coverage and diversity of this floral community bordering Area “B” and “C” gradually gives way to sporadic clumps of single species or single individual plants as you get closer to Area “E”. There is a coincident increase in the benthic surface being covered by sediment and its associated filamentous algae. This complex soon completely dominates the bottom as Area ”E” is approached and tuffs or clumps of leafy algae become very sparse. Coralline algae are present as a thin veneer on hard substrates free of silt sediment deposition. Periwinkles occur within this region but not in the high abundances observed in Area ”B”, their numbers decrease as Area ”E” is approached. Observed epibenthic fauna lacks

in both diversity and abundance in this zone. Only a few (ca < 10) live giant scallops (Placopecten magellanicus) and cancer crabs (Cancer sp.) were recorded over all transects examine covering this zone. There were no live horse mussels (Modiolus modiolus) seen although great masses of dead horse mussel shells begin to carpet the bottom as Area “E” is approached. Only a few benthic polychaetes, sea anemones and starfish were observed over all 13 transects surveyed. No other benthic faunal group was seen (i.e. sea urchin, ophuroid, large gastropod, other bivalves, etc.).

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Pic 5 Typical transition zone habitat transect 3 at the 75 m mark, depth 8 m

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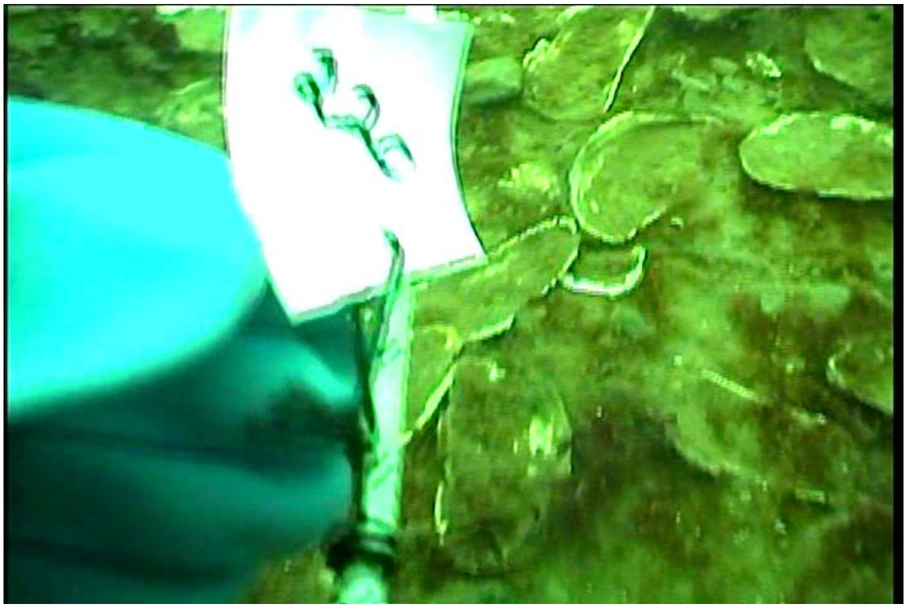
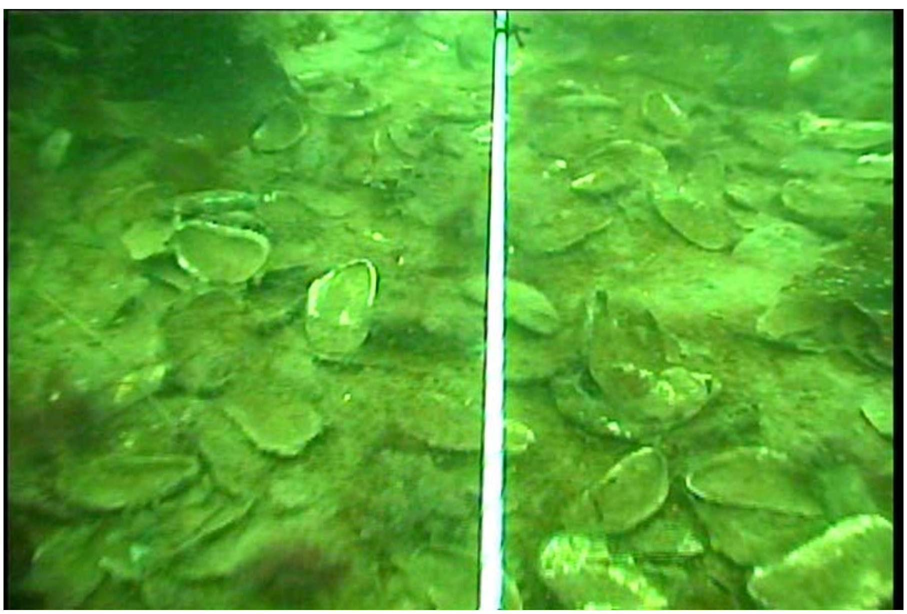


Pic 6 Shell debris line on transect 9 at the 230 meter mark, depth 15 m



Pic 7 Shell debris line on transect 10, at the 230 m mark, depth 14.5 m

Area "E": Barrens

Substrate:
The benthic surface within Area "E" is dominated by a line of dense of Horse Mussel (Modiolus modiolus) shell debris. This line is well defined and occurs within a depth range of 10m to 15 m. Shell concentrations become patchy and markedly reduced size as you move out through Area "E". The shell debris is covered with a veneer of silt/clay sediment with an associated filamentous algal veneer. The zone is topographically bleak and barren there are no large rocks/cobble/or bolder sized material on or protruding the benthic surface.

Flora and Fauna
The filamentous algal veneer associated with the fine sediment layer over the shell debris is characteristic of this zone. All macrophytic algae are essentially gone. Coralline algae are found infrequently due to the lack of hard substrate free of the sediment/algal veneer. There is a small increase in the number of benthic polychaete tubes that visibly protrude from the surficial sediments in areas that are free of a covering of shell debris. Stalked anemones and starfish are rare as are periwinkles. No lobsters were seen although there is evidence of lobster habitation (burrows in soft sediments) at the outermost reaches of this area surveyed. Conspicuous by their absence are ophuroids, sea urchins, crabs, gastropods (other than periwinkles), bivalves, benthic arthropods and other species groups associated with silt/mud bottoms within boreal temperate marine coastal waters of depth regime off Nova Scotia

Area of marine habitat by type

Table 2 Impacted marine habitat

Type	Description	Area sq m	Suggested factor	Compensation area
A	Inshore band of cobble / gravel washed clean - infill	4,000	1	4,000
B	Dense algae growth. Mainly fucus 100% + coverage - infill	60,750	3	182,250
C	Eel grass bed - infill	7,250	3	21,750
D	Transition area – coralline algae and a few macrophytes - <50% coverage - infill	99,250	2	198,500
E	Barren grounds – D - E edge is a line of horse mussel shells and shell debris - infill	47,750	1	47,750
F	Barren grounds – dredged area	39,570	1	39,570
				0
Total		258,570		493,820

The total marine area impacted is 258,570 sq m. With various suggested compensation rates based on the productive quality of the existing benthic habitats there is a total compensation area of 493,820 sq m.

Freshwater habitat impacted

Twenty-six stream crossing sites were identified in AMEC 2008, five on or directly downstream of the Project footprint and twenty-one on or directly downstream of the proposed Rail Corridor. Two unnamed watercourses located in the community of Pirate Harbour (the site of stream crossings S#10 and S#11) and one tributary to Melford Brook (S#23) were found to be dry channels. A fourth stream crossing site, S#25, was not visited because there was no influence from S#23, water quality and quantity at this site would have been similar to S#22.

Table3: Hydraulic Characteristics for Watercourses within the Logistics Park footprint

Stream Crossing	Location	Channel Width (m)	Wetted Width (m)	Average Depth (cm)	Maximum Depth (cm)	Slope (%)	Flow (L/min)
S#17	Unnamed watercourse in Melford	1	0.5	5	50	2	1.5
S#18	Unnamed Melford Brook tributary	2.5	1.5	6	8	1	5.0
S#19	Melford Brook	10	10	40	96	1	532.5
S#20	Unnamed Melford Brook tributary	1.5	1	8	10	1	0
S#21	Unnamed Melford Brook tributary	2.5	1.5	14	20	1	7.4

Table 4: Hydraulic Characteristics for Watercourses along the Rail Corridor

Stream Crossing	Location	Channel Width (m)	Wetted Width (m)	Average Depth (cm)	Maximum Depth (cm)	Slope (%)	Flow (L/min)
S#01	Unnamed watercourse in Melford	2.5	1.2	10	16	5	0.6
S#02	Byers Brook	3	2	10	20	2	2.3
S#03	Unnamed watercourse between Wheaton and Critchetts Lake	2	2	8	12	1	6.6
S#04	Unnamed watercourse in Steep Creek	3.5	3	10	50	2	0
S#05	East Brook	3	2.5	8	12	2	1.8
S#06	Unnamed watercourse in Pirate Harbour	3	2	10	24	1	2.2
S#07	Unnamed watercourse in Pirate Harbour	2.5	2	10	24	2	2.2
S#08	West Brook	4.5	3.5	15	24	2	14.3
S#09	Unnamed West Brook	3	1.3	12	16	1	3.7

Table 4: Hydraulic Characteristics for Watercourses along the Rail Corridor

Stream Crossing	Location	Channel Width (m)	Wetted Width (m)	Average Depth (cm)	Maximum Depth (cm)	Slope (%)	Flow (L/min)
	tributary						
S#10	Unnamed watercourse in Pirate Harbour	0	0	0	0	N/A	N/A
S#11	Unnamed watercourse in Pirate Harbour	0	0	0	0	N/A	N/A
S#12	Unnamed Murray Brook tributary	1.8	1	12	14	1.5	3.1
S#13	Unnamed Murray Brook tributary	5	3.5	20	28	3	17.2
S#14	Murray Brook	3.5	2.5	15	21	1	18.2
S#15	Murray Brook	3	2	15	20	0.5	11.1
S#16	Berrys River	2	1.3	6	8	1	1.5
S#22	Melford Brook	5.5	4.3	15	30	0.5	56.8
S#23	Unnamed Melford Brook tributary	0	0	0	0	N/A	N/A
S#24	(from private generating station to Melford Brook)	5.7	5.7	45	60	0.5	316.3
S#26	Unnamed Melford Brook tributary	0.2	0.2	2	5	0	0

Note: N/A denotes not applicable (dry channel) from AMEC 2008

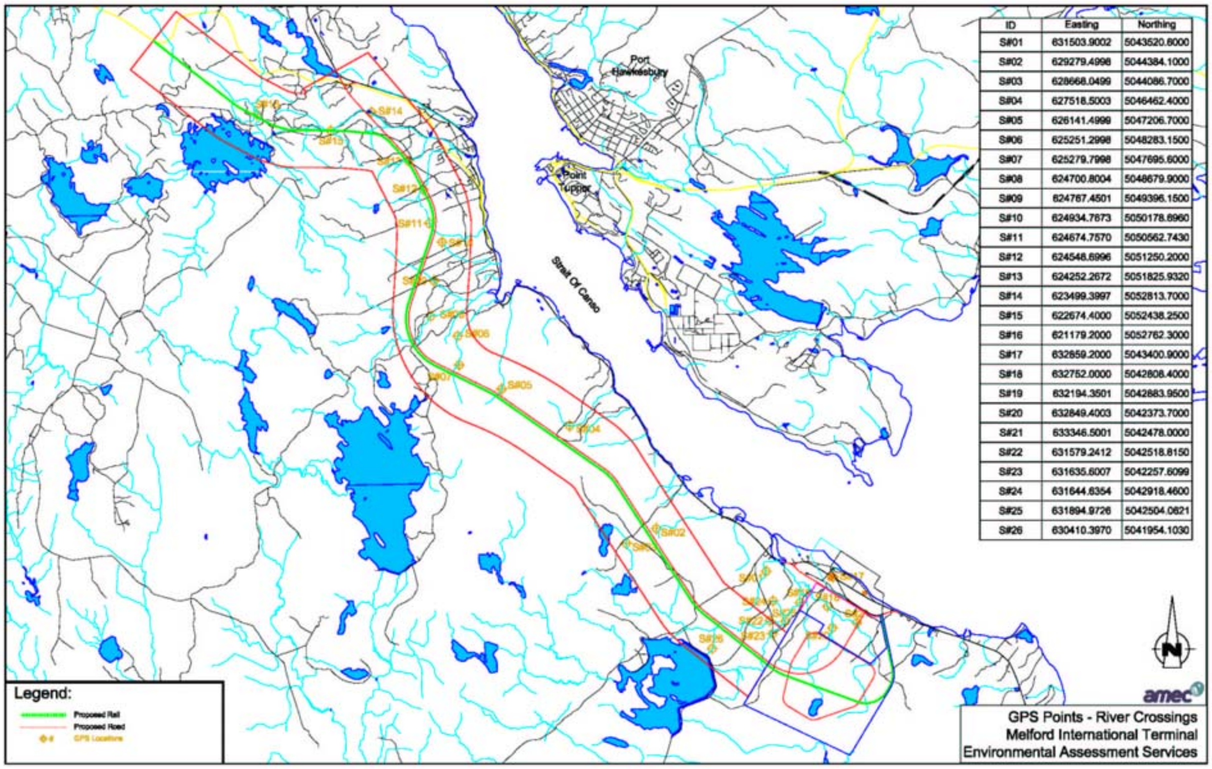


Fig 6 Map of the rail corridor and identified stream crossings

All stream crossings will be open box culverts until the rail line reaches the logistics area then it will begin to descend through an open cut. Open box culverts are effective at protecting fish habitat in areas were the footings can be placed near the ground surface. In areas that require a lot of overburden excavation for the footings the work may encroach on the stream habitats. Detailed geo-technical surveys for the crossings have not been done. However, if it is found that the habitats will be impacted by the culvert installation the on site habitats will be restored in a way to create equal or better Brook trout habitat. There will be no net loss of habitat from these stream crossings.

Watercourses in the logistics area.

The logistics area will be developed over the next 10 years. The figure below shows the rail cuts that will intercept the flow from the streams and directing the flow along the deep cut to the ocean at the east end of the development. All the streams are Brook trout habitat and support all life stages.

Parts of the habitat will still be functional for several years as the development grows. However, these are small watersheds and the trout habitats will be stressed by low summer flows and winter conditions. These stressors will be felt particularly on adult trout habitats and the fish using these habitats move between the stream and the sea on a seasonal basis to find suitable living conditions. This means access to and from the sea is very important as is maintaining flow levels. Trout will be cut off from the upper parts of the watershed and the lower sections will be dry or have severely reduced flows.

The rail cuts are amoung the earliest construction work on the site so it is proposed that the entire habitat be considered lost at this time and compensation work begin as soon as all approvals for the project are obtained.

The fish habitat areas have been estimated by calculating the stream size expected for the watershed area of each reach listed in table 5 and the length of the streams calculated from the topo map. These were crosschecked against field measurements done by AMEC at some of the sites. More field investigation may be required for the final compensation agreement. Water flow in the main river will be reduced by a portion equal to the size of the watershed lost, which is 14%. The water from the back tributary will still flow to King Brook.

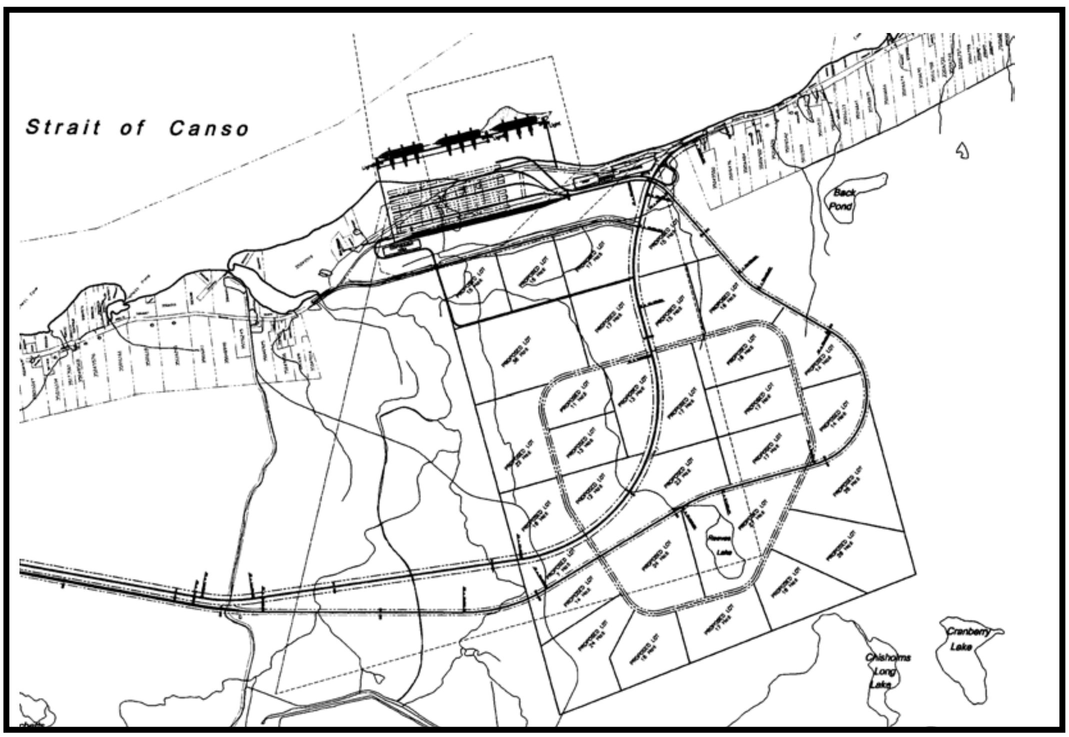


Fig 7 Location of rail cuts in the logistics park area.

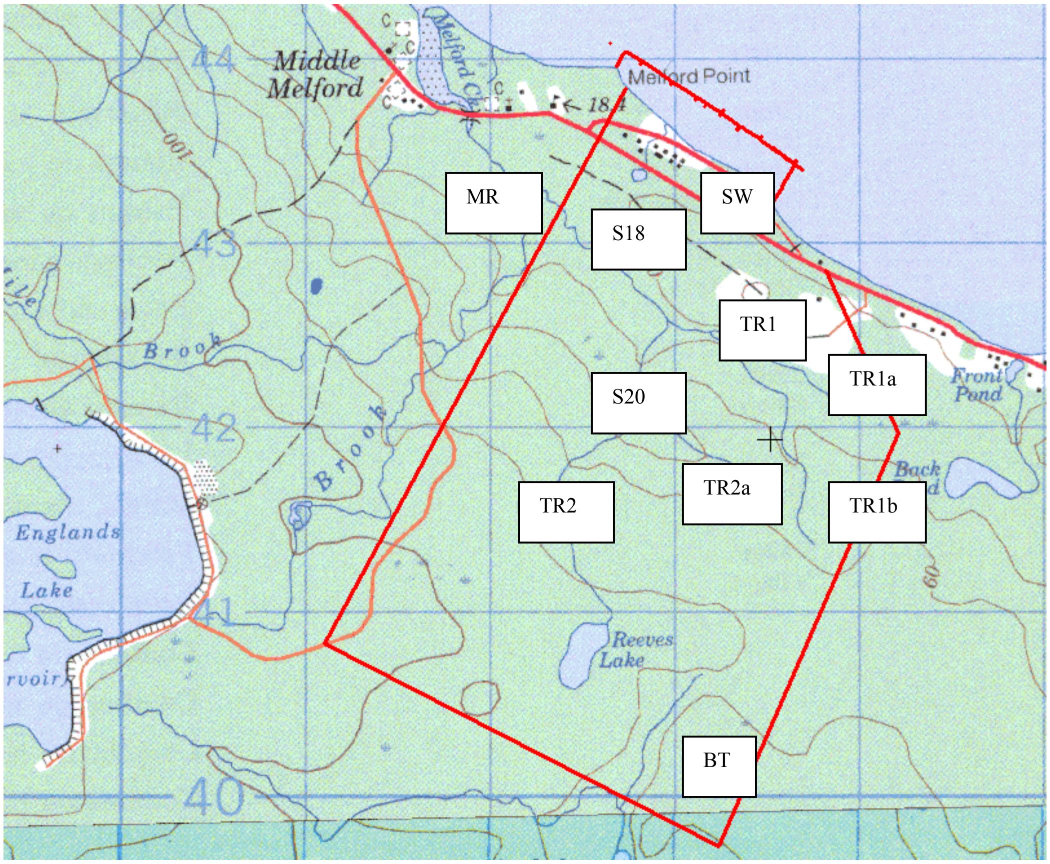


Fig 8 Stream reaches impacted by the development of the logistics park

Impacted watercourses

Table 5. Areas of streams impacted by logistics park development.

Location	Description	Calculation length X width	Area sq m	Suggested factor	Compensation area
MR	Main river reduced flow loss of 14% of watershed	431 X10= 4310(0.14)	603	3	1809
S18	Main flow from property	1236 X1.5	1854	3	5562
T1	Tributary from right bank	247 X 1	247	3	741
	Pond on T1R		5447	3	16341
TR1a		876 X0.75	657	3	1971
TR1b		1480X 0.75	1110	3	3330
S20	Main stream from Reeves lake	533X1	533	3	1599
TR2a	Trib. to S20	610X0.75	457	3	1371
TR2	Brook from Reeves	1555X1	1555	3	4665
	Reeves Lake		58257	3	174771
BTR	Back tributary King creek watershed	883X0.75	662	3	1986
SW	Small watershed	321X0.05	160	3	480
Pond	Small watershed		4227	3	12681
Total			75769		227307

The loss of freshwater habitat is estimated to be 75,769 sq m and at a three to one compensation ratio this requires 227,307 sq m of habitat to be restored.

Description of the Proposed Compensation Work

Location of the Proposed Marine Compensation Work

There are two proposed restoration areas. One is to the east of the terminal toward Eddy Cove/Eddy Point and the other is in the Salmon River estuary Guysborough County. Project 1 is sub tidal habitat restoration adjacent to the infill and dredging site. Project 2 is the opening of a tidal restriction at the barrier beach in the Salmon River estuary Guysborough, Nova Scotia. Both projects will require permits from NWPA and authorization from DFO.

Marine compensation project descriptions

Project 1

The first preference in the habitat hierarchy is to replace like for like habitat as close to the site as possible.

To do this we propose that habitat development work be undertaken to the southeast of the infill site toward Eddy Cove and in the outer 50m of the transition area and approximately 250m seaward staying in less than 20m of water along the coast to the east of the terminal infill for approximately 1.6 km. Video transects in this area during the summer of 2007 and a circle transect 60m in diameter 500m east of the site in the spring of 2008 indicate that the habitat zones in this area are the same as in the impacted area and available for compensation work.

The best timing for this work would be in the late winter and before mid April. This would avoid the local fisheries, avoid the presence of lobster and crab due to the cold water, and place clean substrate down for the plant gametes to settle on.

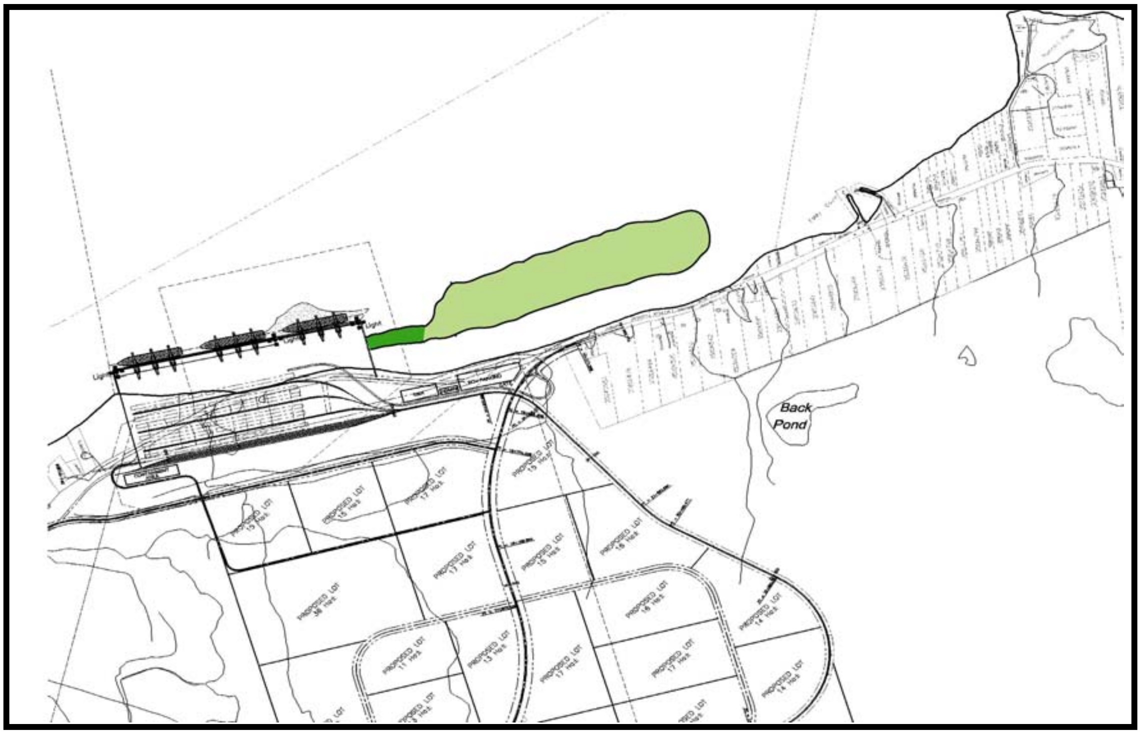


Fig 4 Location of marine compensation project 1. The eel grass bed in dark green and the algae bed in light green.

The eelgrass bed

The existing eelgrass bed is in 3 to 5m of water on the lee side of the point. A similar location is on the lee side of the infill. To replace the eelgrass bed it is proposed that an area adjacent to the infill on the southeast side and adjacent to the outside of the macrophyte area “B” be constructed as an eelgrass bed.

To do this the area needs to be set back from the outside of the terminal pad approximately 50m, a berm of rip rap rock place along the outer edge of the area to a low water depth of 3m, then the inside of the area infilled with a mixture of course sand infilling and over 15cm to 20 cm rock to a depth of between 3 and 5m from the surface. The area of this eelgrass bed will be approximately 75m by 290m = 21,750 sq m. Transplanting of the eelgrass can be considered if the compensation work is done along with the infill, although the standard transplant techniques are not designed for work in this depth of water.

The algae bed

The most productive habitat in the terminal pad area is the fucoid growth in area “B”. Not only does it provide very high levels of primary productivity it also provides cover and three-dimensional habits for other species of plants and animals. It appears that the limiting factor on the growth of the algae is substrate. Light levels seem to be adequate to a depth of at least 20m and although currents and wave action vary they are with in a suitable range for the various species present at the site within this depth range.

The outer transition area and the barrens area have low primary and secondary productivity and can be used in adjacent areas to replace the higher quality habitats.

To replace the macrophyte beds bed it is proposed that the bottom type be changed in the area 50m inside of the outer edge of the transition area, along the band of horse mussel shells, and 250m outside this line staying in less than 20m of water for approximately 1.6km. This is an area of approximately 480,000 sq m and is large enough to meet the compensation requirement when combined with the eelgrass bed. While the species of macrophytes in this area may be different from the inshore area that will be lost, the primary productivity will be similar. The species diversity will be greatly increased.

The pattern of how the rock is placed on the bottom depends of the objectives of the restoration. If adult lobster habitat is preferred, piles of 15cm to 20cm rock in patches 2m in diameter and ½ m high, spaced 3m apart would be appropriate. If a more diverse habitat is the objective, a mixture of rock from 2 cm up to 20 cm plus boulders of 45cm to 100 cm in diameter with 5% coverage would be used to provide interstitial spaces for a diversity of crabs and the various life stages of lobster. If the objective is replacing the macrophytes over the whole area, in a density similar to what will be lost, then covering the whole area with either of the above rock mixtures would be appropriate.

This plan is based on the benthic video of the proposed habitat development area and the assumption that this area will have the same circulation patterns and habitat parameters for the desired species. While these are good assumptions the work is still experimental. Studies in Halifax Harbour and St Margaret’s Bay by DFO have shown very good results for similar habitat restoration.

For this reason we prose to video transect the area in each of the 5 years following the work to document the habitat development.

A second project has been proposed for marine compensation that can be done instead of project 1 if it considered to be to experimental or in combination with a smaller project 1.

Project 2 Salmon River Guysborough County estuarial tidal restriction.

The estuary of Salmon River Guysborough, tributary to Chedabucto Bay, is restricted by a barrier beach that has a small opening at the north end (45 21.440N 61 28.080W topo 11 F6). This opening restricts the tide so that the estuary does not fill on a high tide and the estuary does not fully empty on a low tide. The lack of a full tidal flow in the estuary limits the productivity of marine plants in the lower estuary including the eelgrass beds and fucoid growth. This limit on primary productivity also limits secondary productivity, physical habitat structure provided by the macrophytes, and food for fish living in the estuary. Fish passage in and out of the estuary is also restricted at times of low river flow and low tide heights.

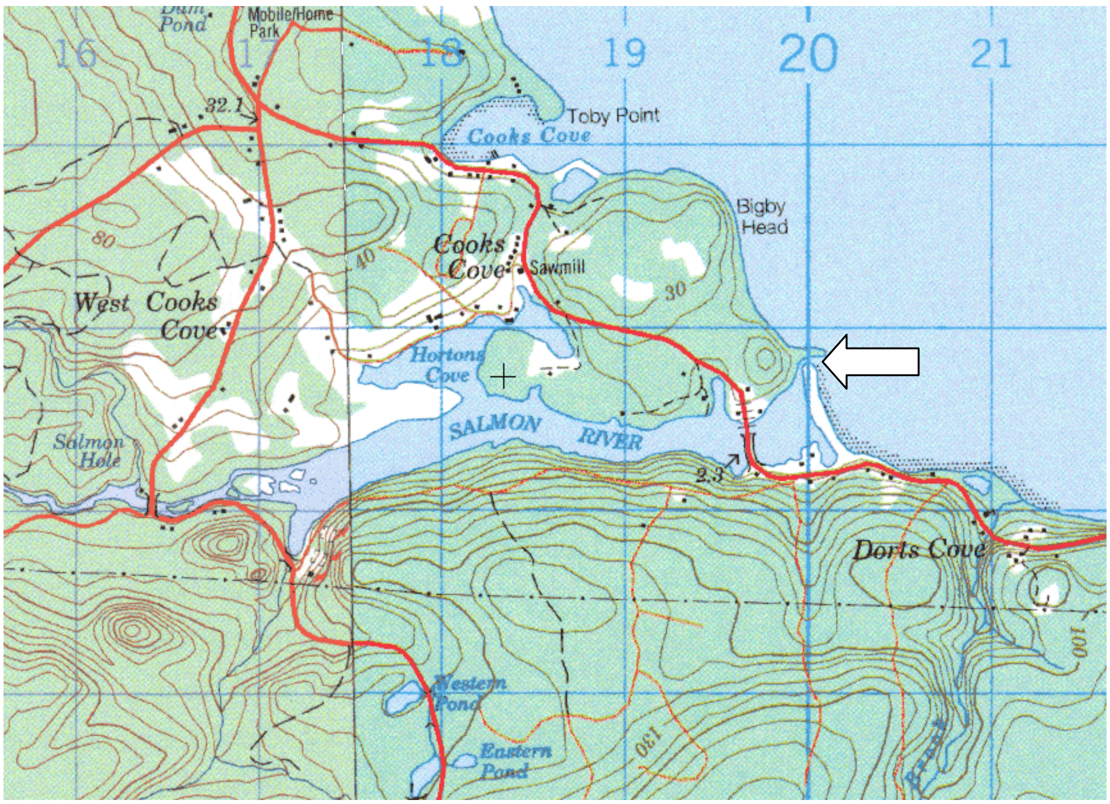


Fig 5 Location of Salmon River estuary work.

This situation is the same as was seen in St Francis Harbour River estuary a site that was successfully restored in early of 2007 by rocking the north shore of the outlet channel creating a hard edge for the flow to push against and dig the channel through the barrier beach slightly wider and much deeper. This channel allowed the full tidal cycle in and out of the estuary increasing the flood tide level by over 40 cm and dropping water levels at low tide by 35cm. Surveys in the fall of 2007 showed greatly increased plant growth both in density and in area. The plants are mainly eelgrass and fucoids but kelp and a small salt marsh appear to be developing. The estuary was used for herring spawning for the first time in many years, salmonids were seen grazing in the algae filled shallows, and estuarial marine species increased in numbers and diversity (Rutherford 2007).

Initial assessments of the Salmon River estuary show the same characteristics as the St Francis Harbour River did prior to the restoration work. Tidal flow is estimated to be only 60% of normal. It is felt that this simple technique would be just as effective in this watershed. The area expected to benefit from this restoration is up to 940,000 sq m. Experience has shown that only the lower estuary gains the benefit of full marine growth similar to what is lost in the Melford site and the increase in productive capacity is in addition to an already productive area. However, there is easily enough opportunity here to match the 493,820 sq m of marine habitat compensation needed.

The project is supported by local anglers and the Guysborough RDA who will act as the community group managing the project, if that is required.

Final designs and compensation assessments can be done if this project is accepted as a compensation site. The report would be very similar to the St Francis Harbour compensation plan on file at DFO. Monitoring of the results should be done just before the work in done and each spring and fall in years 1, 3 and 5 following the work.

Proposed freshwater compensation project - St Francis Harbour River.

The proposed compensation work is all in the St Francis Harbour River watershed. This watershed actually shares some wetland headwaters with many of the impacted watercourses.

This watershed has been the site of habitat restoration work for many years now. The estuary work was done in the winter of 2007, in river deflectors and rock sill have been placed in several locations in the main river, fish passage has been built at Goose Harbour Lake and a cold-water siphon has been installed to provide a cold water base flow in the river, a local community run fish hatchery has been established with the assistance of Nova Scotia Fisheries Department, and a detailed restoration plan developed for the river reach at the head of the estuary. All this work has been very successful and has been done by The Mulgrave and Area Lakes Enhancement Association (MLEA*)* on a priority basis as funds have become available though the Nova Scotia Adopt-a-Stream Program, Nova Scotia Salmonid Enhancement Program, compensation funds from other smaller projects, and fund raising initiatives.

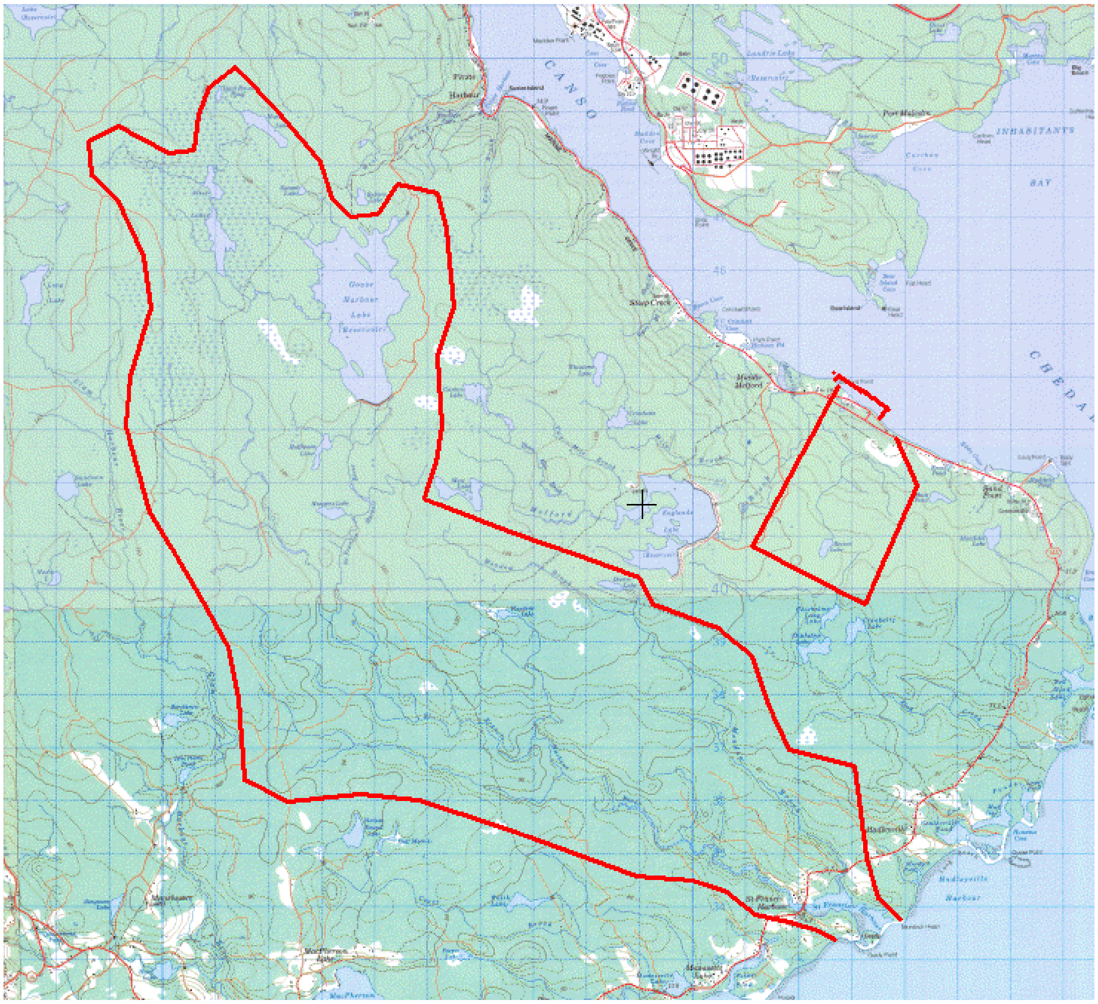


Fig 9 Location of proposed restoration watershed in relation to the project site. St Francis Harbour River estuary is located at 45 26.640N   61 17.345W (NAD 83) topo Map 11 F6

This compensation work provides an opportunity to complete and implement a full watershed plan. The first of its kind in the DFO Maritimes Region. The river is adjacent to the lost watercourses and meets the priority for replacement of the lost productive capacity for the same stock and like for like habitat. Work to date in this river indicates we can re-introduce self-sustaining populations of Atlantic salmon, and Gaspereau, and greatly increase Brook trout and sea run trout populations.

This would be a 5 to 10 year project for the local group beginning with the development of a detailed plan as work proceeds on the restoration work already planned at the head of the estuary and in the main river.

To date the MLEA has done an over all assessment of the watershed and has been planning the restoration work in detail for priority areas as required to support proposals for NGO cost shared programs.

The general plan that will be further detailed if this proposal is accepted is as follows:

- The main stem of St. Francis Harbour River requires rock sills and deflectors to create pools and to narrow the river to the proper width for the one in two year storm with a functional flood plain. This is needed since the dam/lake constructed in the headwaters reduced the size of this flow. Structures of this type and design that have already been placed in the river have been very successful. The main stem, bank full averages 13 to 16 meters, and there is 4000 m remaining to be done including the head of tide area. There are 56000 sq meters of habitat available for restoration.

- Tributary work, including Meadow Brook, requires digger logs, deflectors, debris removal, and thalweg and pool development. The area of tributaries in this watershed that need restoration is approximately 190,000 sq m.

- In addition there is a need to construct a new channel with fish habitat below the dam to connect the spill area and fishway to the outflow of the cold water siphon. This improvement would mean there will be enough flow and suitable passage for Gaspereau and trout up into Goose Harbour Lake. The lake provides ideal habitat for Gaspereau that will in turn provide forage fish for the salmonids in the lake during the summer and in the estuary over the critical winter months. This channel is 1 km long and 7m wide for an additional 7000 sq m but more important is the great increase in productivity provided by the Gaspereau. Half Moon Lake, Hunson's Lake, and Hayden Lake will also be accessible to Gaspereau after debris removal. The reestablishment of the Gaspereau run in this river will require the stocking of Gaspereau for 3 years from an near by river. Stocking of Gaspereau has proven successful in other Nova Scotia rivers.

The exact number of structures will need to be determined on the ground, but the main river will need in the order of 50 structures and the tributaries an estimated 300 structures plus debris clearing. Access to many of the work areas is poor and will require extra time and expenses to get the work done. The proposed area for restoration is 253,000 sq m plus of minis 10% depending on the outcome of the detailed survey and habitat restoration needs. This meets or exceeds the compensation area required without including the anticipated benefits from the introduction of Gaspereau.

How quickly the restoration can be delivered by MLEA, as a small organization, which is currently all volunteers is not definite at this time. Work will begin as soon as the all the approvals are given for both the Melford Terminal and DFO/ NSEnv approval for the instream work and the funds are made available. The restoration work will likely take 5 to 10 years to complete. Work in the first year will include a detailed restoration plan and initiation of currently planned work.

All instream work will be done between June 1 and September 30 and preferably under a blanket permits good for the duration of the work.

Monitoring of progress on the plan implementation and effectiveness of the work done will be reported on each year as the project proceeds. Completed work will be monitored for 5 years to ensure it is structurally sound and creating the habitat it was intended for. Work done in the latter years of the project will be reported on in years 1, 3 and 5 as appropriate. Yearly electrofishing will be done at four standard sites to be selected during the planning stage. These will be done yearly for the years it takes to implement the project in order to follow the population dynamics of salmonids in the restored areas. An automatic fish counter in the Goose Harbour Lake fishway may replace one of the monitoring sites if this becomes technically feasible.

Conclusion

All mitigation and design measures have been taken to minimize the loss of fish habitat productivity in both the marine and freshwater. The loss of 258,570 sq m of marine habitat can be compensated for by increasing the productivity of adjacent habitats or the restoration of the tidal flow in the Salmon River estuary, which is in the same Chedabucto Bay ecological unit. The freshwater habitat loss of 75,769 sq m can be compensated for by the increase in productivity of the habitats in the adjacent St. Francis Harbour River Watershed for the same species, Brook trout, plus the opportunity to develop Atlantic salmon and Gaspereau habitats. The compensation plans meet the requirement of the Fisheries Act and Habitat Policy.

References

AMEC 2008, Environmental Assessment for the Proposed Melford International Terminal

Rutherford 2007, St Francis Harbour, Nova Scotia, Biological Assessment of the Intertidal Zone, Thaumas Environmental Consultants Ltd.